What Is Claimed Is:

1   1. A method of estimating a plurality of current density parameters characterizing

2   electrical signals that would be transferred on a signal lead of an integrated circuit, said signal

3   lead connecting a driver cell to a load cell, said method being performed in a computer aided

4   design (CAD) tool used to design said integrated circuit, said method comprising:

5   modeling said driver cell in the form of a trapezoid signal and said signal lead in the

6   form of an impedance network, wherein one parallel end of said trapezoid signal is

7   substantially short compared to other parallel end of said trapezoid signal;

8   simulating an operation of said integrated circuit by providing said trapezoid signal

9   as an input to said impedance network; and

10   measuring electrical signals on said impedance network to estimate said plurality of

11   current density parameters on said signal lead.

1   2. The method of claim 1, wherein said one parallel end contains a single point such

2   that said trapezoid signal comprises a triangle signal.

1   3. The method of claim 2, wherein said modeling comprises:

2   receiving a first plurality of parameters characterizing operation of said driver cell;

3   and

4   computing a second plurality of parameters characterizing said triangle signal based

5   on said first plurality of parameters.

1   4. The method of claim 3, wherein said triangle signal contains a positive peak and

2 a negative peak, said first plurality of parameters comprises an average current (Javg), a root

3 mean square current (Jrms), a positive peak level (Jpkp), and a negative peak level (Jpkn),

4 wherein durations of a positive portion of said triangle (Ta) and a negative portion of said

5 triangle (Tb) are computed according to the equations:

6 $$Ta = [\{6\ T\ Jrms^2 + (8\ T\ Javg\ Jpkn)\} / \{Jpkp\ (Jpkp + 2\ Jpkn)\}];$$

7 and

8 $$Tb = [2\ \{6\ T\ Jrms^2 - (4\ T\ Javg\ Jpkp)\} / \{Jpkn\ (Jpkp + 2\ Jpkn)\}].$$

1 5. The method of claim 4, wherein said impedance network comprises at least one

2 resistor and at least one capacitor.

3 6. A machine readable medium carrying one or more sequences of instructions for

4 causing a system to estimate a plurality of current density parameters characterizing

5 electrical signals that would be transferred on a signal lead of an integrated circuit, said signal

6 lead connecting a driver cell to a load cell, wherein execution of said one or more

7 sequences of instructions by one or more processors contained in said system causes said

8 one or more processors to perform the actions of:

9 modeling said driver cell in the form of a trapezoid signal and said signal lead in the

10 form of an impedance network, wherein one parallel end of said trapezoid signal is

11 substantially short compared to other parallel end of said trapezoid signal;

12 simulating an operation of said integrated circuit by providing said trapezoid signal

13 as an input to said impedance network; and

14 measuring electrical signals on said impedance network to estimate said plurality of

15   current density parameters on said signal lead.

1   7. The machine readable medium of claim 6, wherein said one parallel end contains

2   a single point such that said trapezoid signal comprises a triangle signal.

1   8. The machine readable medium of claim 7, wherein said modeling comprises:

2   receiving a first plurality of parameters characterizing operation of said driver cell;

3   and

4   computing a second plurality of parameters characterizing said triangle signal based

5   on said first plurality of parameters.

1   9. The machine readable medium of claim 8, wherein said triangle signal contains a

2   positive peak and a negative peak, said first plurality of parameters comprises an average

3   current (Javg), a root mean square current (Jrms), a positive peak level (Jpkp), and a negative

4   peak level (Jpkn), wherein durations of a positive portion of said triangle (Ta) and a negative

5   portion of said triangle (Tb) are computed according to the equations:

6            $Ta = [\{6\ T\ Jrms^2 + (8\ T\ Javg\ Jpkn)\} / \{Jpkp\ (Jpkp + 2\ Jpkn)\}]$;

7   and

8            $Tb = [2\ \{6\ T\ Jrms^2 - (4\ T\ Javg\ Jpkp)\} / \{Jpkn\ (Jpkp + 2\ Jpkn)\}]$.

1   10. The machine readable medium of claim 9, wherein said impedance network

2   comprises at least one resistor and at least one capacitor.

3   11. An apparatus for estimating a plurality of current density parameters

4   characterizing electrical signals that would be transferred on a signal lead of an integrated

5   circuit, said signal lead connecting a driver cell to a load cell, said apparatus comprising:

6   means for modeling said driver cell in the form of a trapezoid signal and said signal

7   lead in the form of an impedance network, wherein one parallel end of said trapezoid signal

8   is substantially short compared to other parallel end of said trapezoid signal;

9   means for simulating an operation of said integrated circuit by providing said

10   trapezoid signal as an input to said impedance network; and

11   means for measuring electrical signals on said impedance network to estimate said

12   plurality of current density parameters on said signal lead.

1   12. The apparatus of claim 11, wherein said one parallel end contains a single point

2   such that said trapezoid signal comprises a triangle signal.

1   13. The apparatus of claim 12, wherein said means for modeling receives a first

2   plurality of parameters characterizing operation of said driver cell, and computes a second

3   plurality of parameters characterizing said triangle signal based on said first plurality of

4   parameters.

1   14. The apparatus of claim 13, wherein said triangle signal contains a positive peak

2   and a negative peak, said first plurality of parameters comprises an average current (Javg),

3   a root mean square current (Jrms), a positive peak level (Jpkp), and a negative peak level

4   (Jpkn), wherein durations of a positive portion of said triangle (Ta) and a negative portion

5   of said triangle (Tb) are computed according to the equations:

6    $$Ta = [\{6 \, T \, Jrms^2 + (8 \, T \, Javg \, Jpkn)\} / \{Jpkp \, (Jpkp + 2 \, Jpkn)\}];$$

7   and

8    $$Tb = [2 \, \{6 \, T \, Jrms^2 - (4 \, T \, Javg \, Jpkp)\} / \{Jpkn \, (Jpkp + 2 \, Jpkn)\}].$$

1   15. The apparatus of claim 14, wherein said impedance network comprises at least one

2   resistor and at least one capacitor.